

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Florence Eschbach et al. Art Unit: 1713
Serial No.: 10/649,355 Examiner: Henry S. Hu
Filed: August 26, 2003 Assignee: Intel Corporation
Title: MOUNTING A PELLICLE TO A FRAME

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Commissioner for Patents
P.O. Box 1450
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BRIEF ON APPEAL

Applicant hereby files this Brief on Appeal to perfect the
Notice of Appeal filed January 5, 2007.

(1) Real Party in Interest

This case is assigned of record to Intel Corporation, who
is the real party in interest.

(2) Related Appeals and Interferences

There are no known related appeals and/or interferences.

(3) Status of Claims

Claims 1-17 and 33-38 are pending. Claims 18-32 have been
canceled pursuant to their withdrawal from consideration. Claim
1 is the sole pending independent claim. Claims 1-17 and 33-38
stand rejected.

(4) Status of Amendments

The response filed December 8, 2006 under the provisions of 37 C.F.R. § 1.116 included an amendment to dependent claim 12. In particular, it was proposed that claim 12 be amended to delete reference to "the flexible reticle" when parent claim 1 only referred to "a reticle."

This claim amendment was not entered for purposes of appeal as "[raising] new issues that would require further consideration and/or search." Accordingly, this amendment to claim 12 has not been entered.

Nevertheless, all amendments to the independent claims whose rejections are appealed have been entered. Consideration of the present appeal brief can thus proceed despite non-entry of the amendment to claim 12.

(5) Summary of Claimed Subject Matter

In photolithography systems, a reticle can be used to transfer a patterned image onto a photoresist. See, e.g., *specification*, page 1, line 5-8. A pellicle can be used to protect such reticles from the particulate contamination that arises due to environmental conditions and handling. *Id.*, page 1, line 16-20.

A pellicle can be a thin, transparent membrane that is held at a fixed distance from a reticle surface by a pellicle frame but yet transmits lithographic radiation to the reticle. *Id.*, page 3, line 20-22; page 3, line 23-page 4, line 1. During lithography, many of the particles on the pellicle may be out of focus on the substrate surface and therefore will not generate a defect during lithography. *Id.*, page 4, line 1-4. The yield of the lithography system can thus be increased. *Id.*, page 4, line 13-14.

A pellicle can be applied to such a frame using organic adhesives. *Id.*, page 4, line 15-16. The present inventors have recognized that exposure of such a pellicle to lithographic radiation can lead to outgassing or evaporation of these organic adhesives. *Id.*, page 4, line 22-24. The outgassed vapors can harm the pellicle by reducing pellicle transparency, cause pellicle thinning, and accelerating pellicle photodegradation. *Id.*, page 5, line 3-5. The outgassed organic vapors may also reduce a pellicle's useful lifespan. *Id.*, page 5, line 8-9.

The inventors have described systems and techniques for addressing these issues. Aspects of these systems and techniques are recited in the claims.

CLAIM 1

Claim 1 relates to a method that includes:

clamping a flexible pellicle between a first frame member and a second frame member wherein the first frame member and the second frame member join to form a pellicle frame (*Id.*, page 7, line 21-page 12, line 4);

mounting the pellicle frame to a reticle by attaching at least one of the first frame member and the second frame member to the reticle (*Id.*, page 12, line 36-page 17, line 2); and

lithographically exposing a substrate to a pattern on the reticle with the pellicle frame mounted to the reticle (*Id.*, page 3, line 8-20).

(6) Grounds of Rejection to be Reviewed on Appeal

The following grounds of rejection are outstanding:

-Claims 1-11 and 33-38 stand rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,300,019 to Ikeda et al. (hereinafter "Ikeda"), the publication entitled "Numerical and Experimental Studies of Pellicle-Induced Photomask Distortions" from Proc. SPIE Vol. 4562, pages 641-651, by E.P. Cotte et al. (hereinafter "Cotte"), and any one of U.S. Patent No. 6,548,129

to Matsukura et al. (hereinafter "Matsukura"), European Patent Publication No. 0416528 to DuPont (hereinafter "DuPont"), or U.S. Patent No. 5,693,382 to Hamada et al. (hereinafter "Hamada"); and

-Claims 12-17 stand rejected under 35 U.S.C. § 103(a) as obvious over Ikeda, Cotte, and any one of Matsukura, DuPont, or Hamada, as well as U.S. Patent No. 6,459,491 to Nguyen (hereinafter "Nguyen").

As set forth in the following concise statements, the following ground for rejection is presented for review:

I. The rejection of independent claim 1 under 35 U.S.C. § 103(a) as obvious over Ikeda, Cotte, and any one of Matsukura, DuPont, or Hamada.

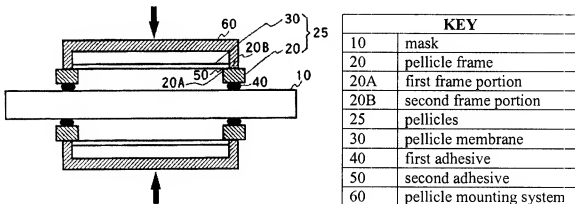
(7) Argument

The organization of the arguments presented hereinafter follows the ground for rejection to reviewed on appeal set forth above. In particular, a separate boldfaced and underlined heading for the ground presented for review follows.

I. The rejection of independent claim 1 under 35 U.S.C. § 103(a) as obvious over Ikeda, Cotte, and any one of Matsukura, DuPont, or Hamada.

The rejection of claim 1 is based on the contentions that 1) Ikeda describes the clamping of a single pellicle membrane between two different frame members, and 2) the recitation of "clamping a flexible pellicle between a first frame member and a second frame member" is not entitled to patentable weight unless Applicants show the "criticality" of why clamping is needed.

Applicant respectfully disagrees with both contentions. In this regard, the rejections have repeatedly pointed to Ikeda's FIG. 2 as showing the clamping of a single pellicle membrane between two different frame members. For the sake of convenience, FIG. 2 is now reproduced, along with a key naming the items designated by Ikeda's reference numerals.



See, e.g., Ikeda, col. 4, line 47-67.

FIG. 2

The rejection has contended that pellicle mounting system 60 is a frame member, such as the first and second frame members recited in claim 1 that clamp a flexible pellicle between them and join to form a pellicle frame.

Applicant respectfully disagrees. Pellicle mounting system 60 is not a frame member. Rather, pellicle mounting system 60 is a pellicle mounting system. Ikeda's pellicle mounting systems are used to press a pellicle to a mask 10 during mounting. See Ikeda, col. 1, line 35-51. It appears that a pellicle mounting system 60 is removed after a pellicle is mounted so that imaging can proceed. For example, every pellicle mounting system 60 is shown as being solid and as spanning the entire pellicle 30. See, e.g., Ikeda, FIGS. 1, 2, 4, 5A, 6A, 6B, 7A, 7B, 9A, 9B. See also Ikeda, FIG. 5B (showing the removal of pellicle mounting system 60 so that particle inspection can proceed).

Since it is unlikely that light can reach the relevant portions of a mask 10 with a solid pellicle mounting system 60 covering the entire span of a pellicle, it is also unlikely that pellicle mounting system 60 covers the reticle during the patterning of a substrate. Thus, even if one were to consider Ikeda's pellicle mounting system to constitute a frame member, claim 1 would still be patentable over Ikeda and the other

references. In this regard, claim 1 recites that a substrate is lithographically exposed to a pattern on the reticle with the pellicle frame that is formed by joining the first frame member and the second frame member mounted to the reticle. Since such lithographic exposure appears to be impossible given that Ikeda's pellicle mounting system is solid, the subject matter recited in claim 1 would still not be obvious to those of ordinary skill even if a pellicle mounting system were taken to be a frame member.

The Advisory Action mailed December 27, 2006 pointed to col. 4, line 49-51 as supporting the contention that Ikeda shows a single pellicle membrane clamped between two pellicle frames. For the sake of convenience, this and adjacent portions of Ikeda are now reproduced.

"FIG. 2 shows the structure of the first embodiment. In the figure, two pellicles 25 are mounted on the mask 10. However, the number of pellicles 25 mounted on the mask 10 is not limited to two. As will be described later, a single pellicle 25 may be mounted on the mask 10. Because the configuration of the upper pellicle 25 and that of the lower pellicle 25 are the same even though their heights differ from each other, for ease of explanation and understanding, in the following only the upper pellicle 25 will be described and the description of the lower pellicle 25 will be omitted." *See, e.g., Ikeda, col. 4, line 43-56.*

Thus, with reference to FIG. 2 reproduced above, in discussing "two pellicles 25," Ikeda is clearly talking about the first pellicle 25 above mask 10 and the second, similarly configured, pellicle 25 below mask 10. FIG. 2 thus shows a one pellicle-to-one frame member ratio, which fails to describe or suggest that a flexible pellicle be clamped between a first frame member and a second frame member, as recited in claim 1.

This one pellicle-to-one frame member ratio is maintained throughout Ikeda. See Ikeda, FIGS. 1, 2, 4, 5A, 6A, 6B, 7A, 7B, 9A, 9B. This is true even for the "second embodiment" of Ikeda's FIG. 4, which was cited as allegedly showing a single pellicle on two different frames. In this regard, FIG. 4 includes a single L-shaped pellicle frame 20 that includes a first frame portion 20A and a second frame portion 20B. See Ikeda, col. 5, line 40-42. FIG. 4 of Ikeda makes it clear that frame portions 20A, 20B are simply different portions of the same single pellicle frame 20, much like frame portions 20A, 20B in FIG. 2 are simply different portions of the same single pellicle frame 20. For example, the cross-hatching indicating a cross section is continuous between frame portions 20A, 20B and there is no break or other space between the frame portions. It would appear impossible to clamp a pellicle between such different portions of a single frame since there is no

interstitial space between the portions. Thus, the one pellicle-to-one frame member ratio is maintained even in Ikeda's "second embodiment."

The other references cited in the rejection do nothing to remedy these deficiencies in Ikeda. Indeed, every reference of record appears to maintain the one pellicle-to-one frame ratio discussed above. See, e.g., Cotte, FIG. 3; Matsukura, Abstract (describing a frame and a pellicle membrane bonded to the frame); DuPont, FIG. 1; col. 6, line 26-49; Hamada, col. 4, line 36-40 (describing that the pellicle membrane is bonded to the frame). None of the cited references are understood to describe or suggest a first frame member and a second frame member, much less the clamping of a flexible pellicle therebetween, as recited in claim 1. Indeed, one of ordinary skill who reads the references would find no reason to depart from the gluing of one pellicle to one frame described in the other references.

Against this backdrop, the rejection contends that the recitation of "clamping a flexible pellicle between a first frame member and a second frame member" is not entitled to patentable weight unless Applicants show the "criticality" of why clamping is needed. In particular, the rejection contends

that "Applicants still need to show the 'criticality' [of] why the clamping method for mounting such a pellicle is needed to show 'unobviousness'..."

Applicant respectfully disagrees. It is well-established that the Office bears the burden of proving a *prima facie* case of obviousness. See, e.g., *M.P.E.P.* § 2142 (citing *In re Warner*, 379 F.2d 1011 (C.C.P.A. 1967), cert. denied, 389 U.S. 1057 (1968)). Absent such a *prima facie* case, Applicants do not need to show "unobviousness" by proving the "criticality" of the recited subject matter or otherwise. *Id.*

In the present situation, even if Ikeda, Cotte, Matsukura, DuPont, and Hamada were combined, one of ordinary skill would still not arrive at the recited subject matter. A *prima facie* case of obviousness has thus not been established. Applicant need not establish criticality or any other factor, since the burden of proof of showing unpatentability is on the Patent Office.

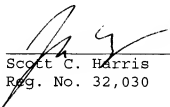
Accordingly, claim 1 is not obvious over Ikeda, Cotte, Matsukura, DuPont, and Hamada in any combination. Applicant therefore respectfully requests that the rejections of claim 1 and the claims dependent therefrom be reversed.

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Respectfully submitted,

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Claim Appendix

1. A method comprising:

clamping a flexible pellicle between a first frame member and a second frame member, wherein the first frame member and the second frame member join to form a pellicle frame; and mounting the pellicle frame to a reticle by attaching at least one of the first frame member and the second frame member to the reticle; and lithographically exposing a substrate to a pattern on the reticle with the pellicle frame mounted to the reticle.

2. The method of Claim 1, wherein the flexible pellicle comprises a polymer membrane.

3. The method of Claim 2, wherein the flexible pellicle comprises amorphous cyclized perfluoropolymer.

4. The method of Claim 1, wherein the flexible pellicle comprises a polymer thermoplastic film having an optical transparency permitting at least 90% transmission at a pre-determined exposure wavelength.

5. The method of Claim 1, wherein the flexible pellicle comprises a polymer thermoplastic film having an optical durability of at least 90% transmission after a plurality of kiloJoules/cm² irradiation equivalent dose at a pre-determined exposure wavelength.

6. The method of Claim 1, wherein said clamping the flexible pellicle between the first frame member and the second frame member applies tension on an outer edge of the flexible pellicle.

7. The method of Claim 1, further comprising heating the first frame member, the second frame member, and the flexible pellicle above a glass transition temperature of the flexible pellicle.

8. The method of Claim 1, further comprising heating the first frame member, the second frame member, and the flexible pellicle up to temperature below a melting point temperature of the flexible pellicle.

9. The method of Claim 8, further comprising cooling the first frame member, the second frame member, and the flexible pellicle.

10. The method of Claim 1, further comprising selecting a first material for the first frame member and selecting a second material for the second frame member, wherein the first material has a lower coefficient of thermal expansion than the second material.

11. The method of Claim 1, further comprising attaching screws to the first frame member and the second frame member.

12. The method of Claim 1, wherein said attaching at least one of the first frame member and the second frame member to the reticle comprises:

placing a polymer layer between the flexible reticle and at least one of the first frame member and the second frame member, the polymer layer having a melting point between about 60 to 150 degrees Celsius; and

heating the polymer layer between about 45 to 150 degrees Celsius.

13. The method of Claim 12, wherein the polymer layer comprises a thermoplastic.

14. The method of Claim 12, further comprising applying pressure to the reticle and at least one of the first frame member and the second frame member during said heating.

15. The method of Claim 12, further comprising forming a hermetic seal between the reticle and at least one of the first frame member and the second frame member.

16. The method of Claim 12, further comprising cutting the polymer layer to match a bottom surface area of at least one of the first frame member and the second frame member.

17. The method of Claim 12, wherein said heating is local to the polymer layer bonding the at least one frame member to the reticle.

18.-32. (Canceled)

33. The method of claim 1, wherein clamping the flexible pellicle comprises friction fitting the flexible pellicle between the first frame member and the second frame member.

34. The method of claim 1, wherein attaching comprises attaching the at least one of the first frame member and the second frame member to the reticle using a low outgas polyester without an adhesive.

35. The method of claim 1, wherein clamping the flexible pellicle comprises stretching the flexible pellicle across the first frame member.

36. The method of claim 1, wherein:

the second frame member comprises a second generally rectangular member;

the first frame member comprises a first generally rectangular member that is dimensioned to fit within the second frame member; and

clamping the flexible pellicle comprises arranging the flexible pellicle across the first frame member and fitting the first frame member in the second frame member.

37. The method of claim 1, wherein clamping the flexible pellicle comprises clamping a perimeter of the flexible pellicle between the first frame member and the second frame member.

38. The method of claim 37, wherein clamping the perimeter of the flexible pellicle comprises clamping a rectangular perimeter of the flexible pellicle between the first frame member and the second frame member.

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Evidence Appendix

None.

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Related Proceedings Appendix

None.